(12) PATENT ABRIDGMENT (11) Document No. AU-B-14034/88
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 601830

(54) Title
TRENCHING M/C GUIDED BY HAND

(51)⁴ International Patent Classification(s)
E02F 005/06

(21) Application No. : 14034/88 (22) Application Date : 27.03.87

(23) Filing Date of Complete Specification : 18.03.88

(43) Publication Date : 29.09.88

(44) Publication Date of Accepted Application : 20.09.90

(60) Related to Provisional(s) : PI1111

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(56) Prior Art Documents
AU 548982 81699/82 E02F 5/06
AU 510595 17506/76 E02F 5/06

(57) Claim

1. A trenching machine comprising a wheeled frame with handles at one end for guiding movement of the machine along the ground, motor means on the frame, said motor means driving a digging chain carried on a chain guide extending from the front of the machine, the chain guide being pivotally mounted coaxially with a drive chain drive sprocket, means for pivotally moving the chain guide relative to the frame and including locking means to lock the chain guide in a desired pivotal position, and anchor means mounted on the frame and engageable with the ground to inhibit movement of the frame along the ground.

AUSTRALIA

601830

Form 10

PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

Short Title:

Int. Cl:

Application Number:
Lodged:

Complete Specification—Lodged:
Accepted:
Lapsed:
Published:

Priority:

Related Art:

TO BE COMPLETED BY APPLICANT

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Complete Specification for the invention entitled:

IMPROVEMENTS IN TRENCHING MACHINES

The following statement is a full description of this invention, including the best method of performing it known to me:—

* Note: The description is to be typed in double spacing, pica type face, in an area not exceeding 250 mm in depth and 160 mm in width, on tough white paper of good quality and it is to be inserted inside this form.

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IMPROVEMENTS IN TRENCHING MACHINES

Field of the Invention

This invention relates to improvements in trenching machines and relates particularly to improvements in hand-operated trenching machines which are moved over the ground by an operator.

Background of the Invention

Trenching machines of the type with which the present invention is concerned are known for use in digging relatively shallow trenches in the ground for installation of pipes, cables, drains and the like.

Such hand-operated machines include a digging arm or boom carrying digging implements which may comprise a bucket-wheel or chain-mounted digging teeth. The digging implements are driven by a motor and the machine may either be wheeled or skid-mounted with handles by which an operator controls the operation thereof.

Hand-operated digging machines are relatively small and light and are, therefore, relatively easily moved from place to place and are able to be used by one person.

Background Art

Australian Patent No. 548,982 disclose a hand-operated trench digging machine of the type referred to above and including a wheeled frame carrying a drive motor which drives a toothed, endless trench digging chain supported by a chain bar extending forwardly of the frame.

The relative position of the chain bar is controlled by a height adjusting lever and the machine is controlled by a pair of rear handles.

This machine suffers from several disadvantages including the use of a chain bar, similar to that of a chainsaw, to guide the toothed chain. Such a chain bar and the associated chain are subject to considerable wear resulting from soil coming between the chain and the surface of the chain bar.

Further, the machine has a strong tendency to

pull to one side due to the offset of the drive mechanism to one side of the machine.

Australian Patent No. 510,595 discloses a trenching machine very similar to that of No. 548,982 but having a transversely mounted power take-off shaft mounted on the frame and extending from each side of the machine. The trenching boom can be mounted to either end of the take-off shaft so as to be offset to one side or the other of the machine.

This machine suffers the same disadvantages as previously referred to in connection with the Patent No. 548,982.

It is desirable to provide an improved, more efficient hand-operated trenching machine for forming relatively shallow trenches.

It is also desirable to provide an improved trenching machine which avoids the disadvantages of known machines.

It is also desirable to provide a trenching machine which is relatively easily handled by one operator and yet which can be used to quickly dig a trench.

It is also desirable to provide an improved trenching machine in which the depth and width of the trench can be varied as desired.

Summary of the Invention

According to one aspect of the invention there is provided a trenching machine comprising a wheeled frame, handle means on one end of the frame for guiding the machine along the ground, motor means mounted on the frame and driving a drive sprocket, a digging chain engaged with the drive sprocket, the chain carrying a plurality of spaced digging teeth, and a chain guide pivotally mounted coaxially with the drive sprocket and extending from the other end of the machine, the chain guide having sprocket means on opposite sides thereof to separate and support the chain and an end sprocket mounted on a carrier with biasing means biasing the carrier away from the drive sprocket to thereby tension the chain.

According to another aspect of the invention there is provided a trenching machine comprising a wheeled frame with handle means on one end of the frame for guiding the machine along the ground, motor means mounted on the frame and driving a digging chain carried by a chain guide extending from the other end of the machine, the chain guide being pivotally mounted coaxially with a drive sprocket, means for pivotally moving the chain guide relative to the frame, said pivotal moving means including locking means for locking the chain guide in a desired pivotal position, and means mounted on the frame and engageable with the ground to inhibit movement of the frame along the ground.

In a preferred embodiment of the invention, the frame is mounted on four wheels to support the machine for movement along the ground. A pair of handles extend from one end of the frame and a releasable belt extends loosely between the handles, adjacent the upper ends thereof, to enable an operator to move the machine along the ground using the belt rather than pulling the handles.

In the preferred form of the invention, the drive sprocket is located substantially on the longitudinal centreline of the frame and is driven by a transverse shaft mounted in bearings on the frame and connected to the motor by pulleys and a drive belt. The chain guide is pivotally mounted to the drive shaft so that the guide can be raised and lowered relative to the wheeled frame.

In the most preferred form, the chain guide is of substantially parallelogram outline, one corner thereof being adjacent the drive sprockets and the spacing sprockets being rotatably mounted on the opposed, adjacent corners. The carrier mounting the end sprocket has a shank which engages within a socket in the outer end of the guide. A biasing spring is located in the socket to bias the end sprocket away from the drive sprocket to thereby tension the chain engaged about the sprockets.

When the trenching machine is in operation, the driven chain, with the digging teeth attached thereto,

is engaged with the ground to commence the formation of a trench. The action of the teeth on the ground surface tends to move the wheeled frame along the ground against the restraining forces applied by the operator. To assist the operator in this regard, the preferred embodiment of the invention is provided with a pivoted, ground engaging foot which can be engaged in the ground to restrict movement of the frame along the ground. When the chain guide has pivoted to the appropriate trench depth position, the ground engaging foot is released from its ground engagement position and the frame can be moved rearwardly across the ground to enable the trench to be formed.

In order that the invention will be more readily understood, an embodiment thereof will now be described with reference to the accompanying drawings.

Description of the Drawings

Figure 1 is a front perspective view of one form of a trenching machine in accordance with the invention,

Figure 2 is a rear perspective view of the machine of Figure 1,

Figure 3 is a side view of the front portion of a chain guide for the embodiment of the invention shown in Figure 1,

Figure 4 is a part sectional view of the chain guide and mounting therefor,

Figure 5 is a side elevational view of the machine showing the chain guide in a raised position, and

Figure 6 is a view similar to Figure 5 with the chain guide in a lowered position.

Description of the Preferred Embodiment

Referring to the drawings, the trenching machine of the present invention comprises a frame 12 carrying four wheels 14 and mounting a petrol engine 16 which drives a digging chain 17 having a plurality of spaced digging teeth 18 fixed to various chain links.

The engine 16 is mounted to one end of the frame 12 (hereinafter referred to as the rear end) while the

chain 17 extends forwardly of the frame 12 substantially centrally or along the longitudinal plane. Thus, forces transmitted to the frame 12 are evenly distributed to the wheels 14.

The chain 17 is driven by a driving sprocket 19 fixed to one end of a drive shaft 21 which is carried by bearing blocks 22 fixed to a support 23 attached to the frame 12. The drive shaft 21 carries at its other end a pulley 24 which is driven by a pair of V-belts 26 passing around the motor pulley (27) ~~24~~. In normal use, a cover extends over the motor pulley 27, drive pulley 24 and V-belts 26, but the cover has been omitted for purposes of illustration.

The chain 17 is guided along an elongated path by a chain guide 28 pivotally mounted coaxially with the drive shaft 21. The chain guide 28 has a pair of side plates 29 and 31 spaced apart by spacers, one of which is shown at 32, (Figure 4). Two guide sprockets 33 and 34 are mounted for rotation between the side plates 29 and 31 at opposed corners thereof so as to guide the chain 17 around the plate edges. At the front end of the chain guide 28 an end sprocket 36 mounted on a movable carrier 37 supports the chain 17. The carrier 37 has a shank part 38 which engages in a socket 39 formed between the side plates 29 and 31. A biasing spring 41 acts on the shank part 38 to urge the end sprocket 36 away from the drive sprocket 19. The spring 41 thus acts to tension the chain 17 and, at the same time, allows the carrier 37 to move rearwardly if a rock or other piece of solid material becomes caught between the chain and one of the sprockets or the chain guide.

In a modified arrangement, not illustrated, the end sprocket carrier 37 is movable in an open guide with an exposed biasing spring 41. This arrangement avoids any possibility of a build-up of soil or the like which may otherwise inhibit relative movement between the shank part 38 and the socket 39.

The teeth 18 carried by the chain 17 are of a

shape as to efficiently and effectively dig a trench in the soil when moved therethrough by the chain 17. The teeth may be of any suitable design known in the art.

If it is desired to remove the chain 17 for replacement or repair or to change it for a wider or narrower chain for the digging of a wider or narrower trench, a tensioning tool 42 is used. The side plate 29 has a hole 43 adjacent the front end and the carrier 37 has a hole 44. The tensioning tool 42 includes a first part 46 having an outwardly extending pin which engages within the hole 43 and a pivoted lever 47 having a further pin which engages within the hole 44. Movement of the lever 47 rearwardly (anticlockwise as shown in Figure 2), moves the shank part 38 rearwardly relative to the socket 39 to thereby enable the chain to be easily and simply removed from engagement with the sprockets.

A hole 45 and a corresponding hole in the shank part 38 receive a removable holding pin (not shown) when the holes are aligned so as to hold the carrier 37 in the rearward or retracted position.

The chain guide side plates 29 and 31 are fixed, as by welding, to a mounting arm 48 having an end plate 49 adapted to be secured to a bearing arrangement 50 mounted on the drive shaft 21 between the two bearing blocks 22. This arrangement enables the chain guide 28 to be pivoted about the axis of the drive shaft 21 between a digging position and a raised position.

A lever 51 fixed to the mounting arm 48 is used for moving the chain guide 28. The upper end of the lever 51 is connected by a rod 52 to a pivoted handle 53. The handle 53 includes a hollow, upper handle part 54 housing an axially movable rod with a pushbutton 56 on its upper end. The upper handle part 54 is fixed to a pair of spaced, lower handle parts 57 which extend on either side of a slotted plate 58 fixed, as by welding, to one of a pair of handles 59 extending upwardly from the rear end of the frame 12. The lower handle parts 57 are pivoted to the slotted plate 58 by a pivot bolt 61 so that the

handle 53 can pivot forwardly and rearwardly. A pawl member 62 is pivoted to the lower handle parts 57 and carries a transversely extending bar 63 adapted to selectively engage one of a plurality of slots 64 in the slotted plate 58. The opposite end of the pawl 62 is disposed beneath and spring biased against the lower end of the upper handle part 54 and is engageable by the lower end of the internal, longitudinally extending rod therein to facilitate movement of the pawl about its pivot point. Thus, operation of the pushbutton 56 causes the pawl 62 to be pivoted around its pivotal mounting on the lower handle part 57 to thereby release the bar 63 from engagement within one of the slots 64. This arrangement enables the chain guide 28 to be raised and lowered by the handle 53 and to be locked into the raised, lowered or appropriate intermediate position, as desired. A spring 66 extending between a bracket on the rod 52 and a bracket on the upper handle part 54 biases the chain guide 28 to an upper pivotal position and acts to counterbalance the weight of the chain guide 28.

The frame handles 59 extending upwardly from the rear portion of the frame 12 have connected between brackets 67 at their upper end a releasable webbing belt 68. In use of the machine, an operator uses the belt about his body to apply the necessary forces to the handles 59 to move the machine across the ground while digging a trench. With this belt 68, there is no need for the operator to pull on the ends of the handles 59, the handles being used only to guide movement of the machine.

In order to prevent the machine moving forwardly when the chain 17 and teeth 18 initially engage the ground while the machine is operating, a ground anchor 71 is pivotally mounted to a rear frame member 72. The anchor device 71 comprises a leg 73 pivotally mounted at one end to brackets 74 extending from the rear frame 72. A torsional spring 76 carried by the rear frame 72 biases the leg 73 to an upwardly extending position. The free end of the leg 73 is provided with a foot plate 77 and

a pointed, ground engaging plate 78 which extends substantially at right angles to the foot plate 77. A ground engaging spike 79 also extends from the leg 73 substantially at right angles thereto, the ground engaging spike 79 providing an additional anchorage.

To restrict soil being thrown over the engine 16 and other parts of the machine, a soil guard 81 is mounted on the frame 12 immediately behind the driving sprocket.

In use, prior to engaging the chain 17 and teeth 18 with the ground, the ground anchor 71 is pivoted downwardly so that the spike 79 and plate 78 engage the ground behind the machine. Pressure applied to the foot plate 77 by the operator firmly embeds the anchor 71 in the ground so that, when the chain 17 and teeth 18 commence digging, the machine is firmly held against forward movement. When the chain guide 28 is at the desired, downwardly extending angle to dig a trench of appropriate depth, the ground anchor 71 is released and pivots under the action of the biasing spring 76 to an upright position.

It will be appreciated that the apparatus of the present invention may undergo various forms of modification within the scope of the invention. Thus, while the preferred shape of chain guide 28 is illustrated in Figure 2, it will be understood that the shape of the side plates 29, 31 may be varied as desired. The particular arrangement illustrated, however, has been shown to be particularly advantageous in directing the chain for optimum digging and for removal of soil from the trench so formed. With the preferred arrangement, a relatively short run of chain extends between the lower guide sprocket 34 and end sprocket 36 thus reducing the tendency for chain deflection resulting from the digging forces. As indicated above the structure of the chain guide ensures that any rocks or other impediments can free themselves without jamming the chain. If desired, a hand-operated clutch mechanism may be mounted on the motor/drive pulley to disconnect drive to the chain without stopping the motor.

Appropriate guards are provided, such as the chain guard 81 located behind the drive sprocket 19.

The claims defining the invention are as follows:-

1. A trenching machine comprising a wheeled frame with handles at one end for guiding movement of the machine along the ground, motor means on the frame, said motor means driving a digging chain carried on a chain guide extending from the front of the machine, the chain guide being pivotally mounted coaxially with a drive chain drive sprocket, means for pivotally moving the chain guide relative to the frame and including locking means to lock the chain guide in a desired pivotal position, and anchor means mounted on the frame and engageable with the ground to inhibit movement of the frame along the ground.

2. A machine according to claim 1 wherein the chain guide includes tensioning means mounted on a carrier and biassed to tension the chain.

3. A machine according to claim 2 wherein the carrier includes a shank movable in socket with a spring biasing the shank in a direction away from the drive sprocket.

4. A machine according to any one of claims 1 to 3 wherein a depth control lever is pivoted to said frame and connects to said chain guide, and latch means on the lever is selectively engageable to restrict relative pivotal movement of the chain guide thereby controlling the depth of the digging chain in a trench.

5. A machine according to any one of the preceding claims wherein the anchor means comprises a ground anchor pivoted at the rear end of the frame and movable between an upwardly extending, inoperative position and a rearwardly and downwardly extending, ground engaging position, the ground anchor having a transversely extending plate to engage in the ground in the ground engaging position.

6. A machine according to claim 5 wherein the ground anchor includes a foot plate above the transverse plate, a ground spike, and a spring to bias the ground anchor to the inoperative position.

7. A machine according to any one of the preceding claims wherein a soil guard is mounted between the drive sprocket and the frame, the guard having a rear, vertical wall with forwardly extending top and side walls.

8. A trenching machine substantially as hereinbefore described with reference to the accompanying drawings.

DATED this 5th day of July, 1990.

BAJAUR HOLDINGS PTY. LTD.

14034/88

Fig. 1.

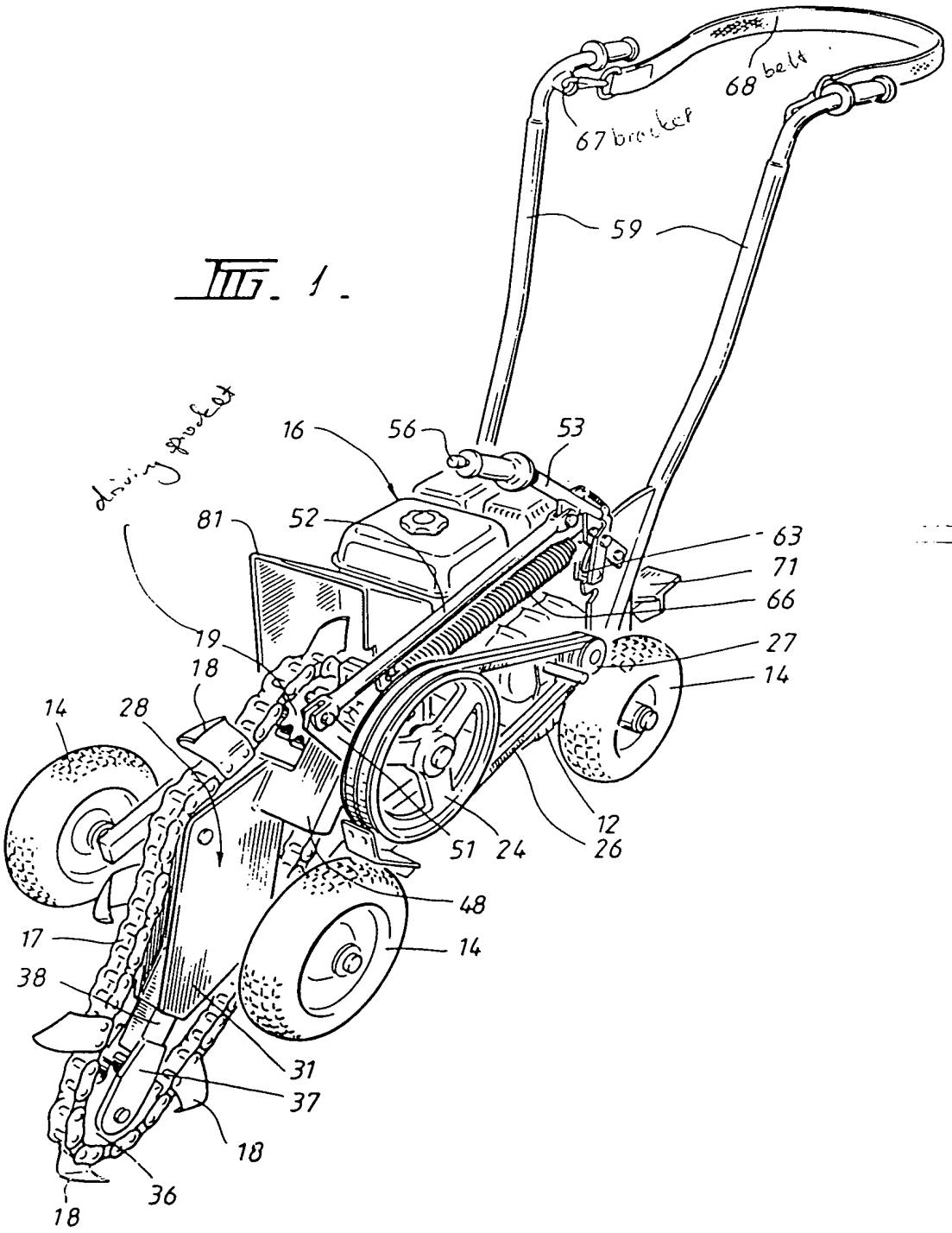
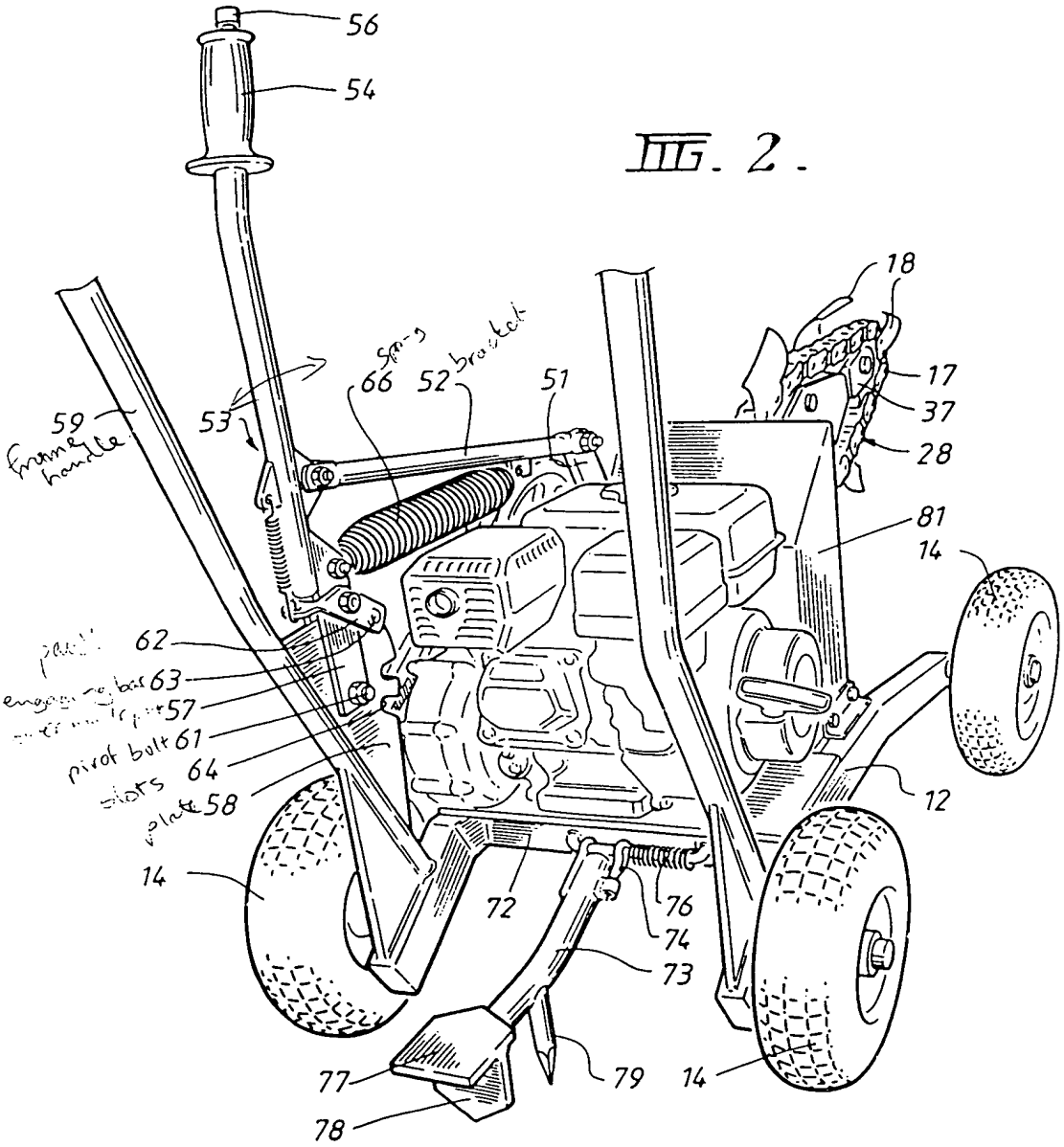


FIG. 2.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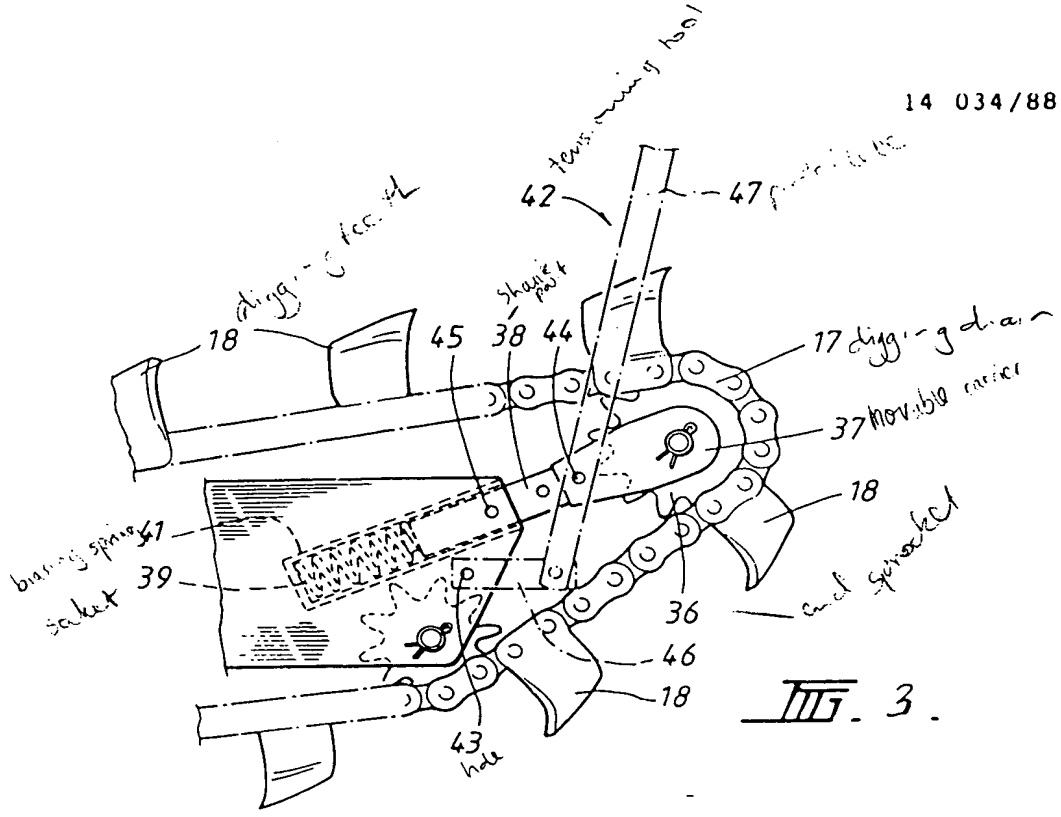
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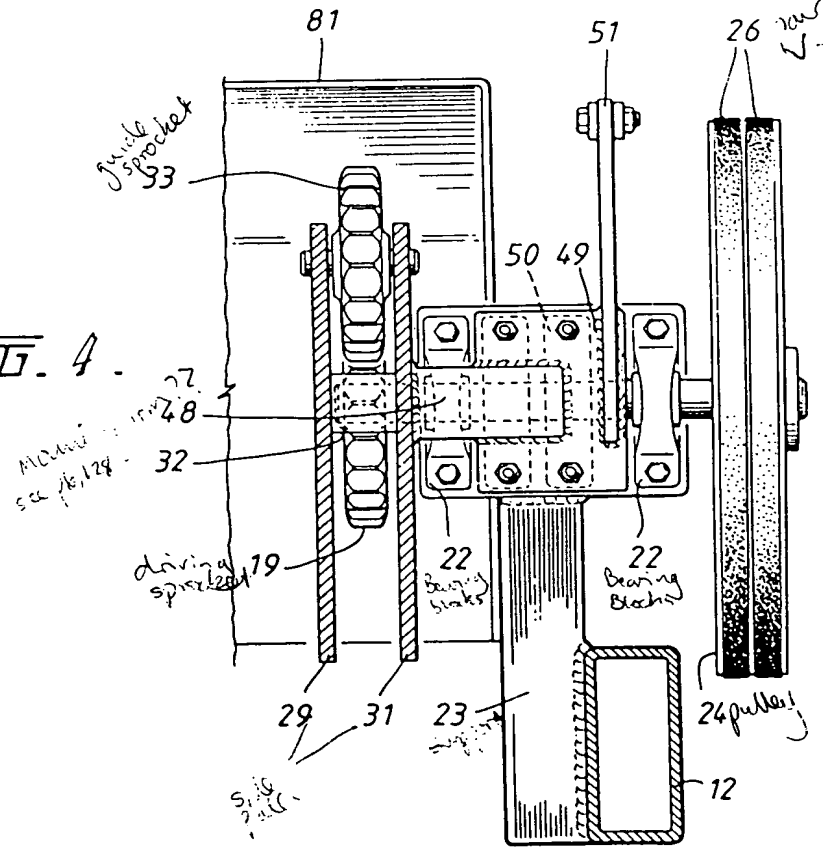
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Fig. 4.

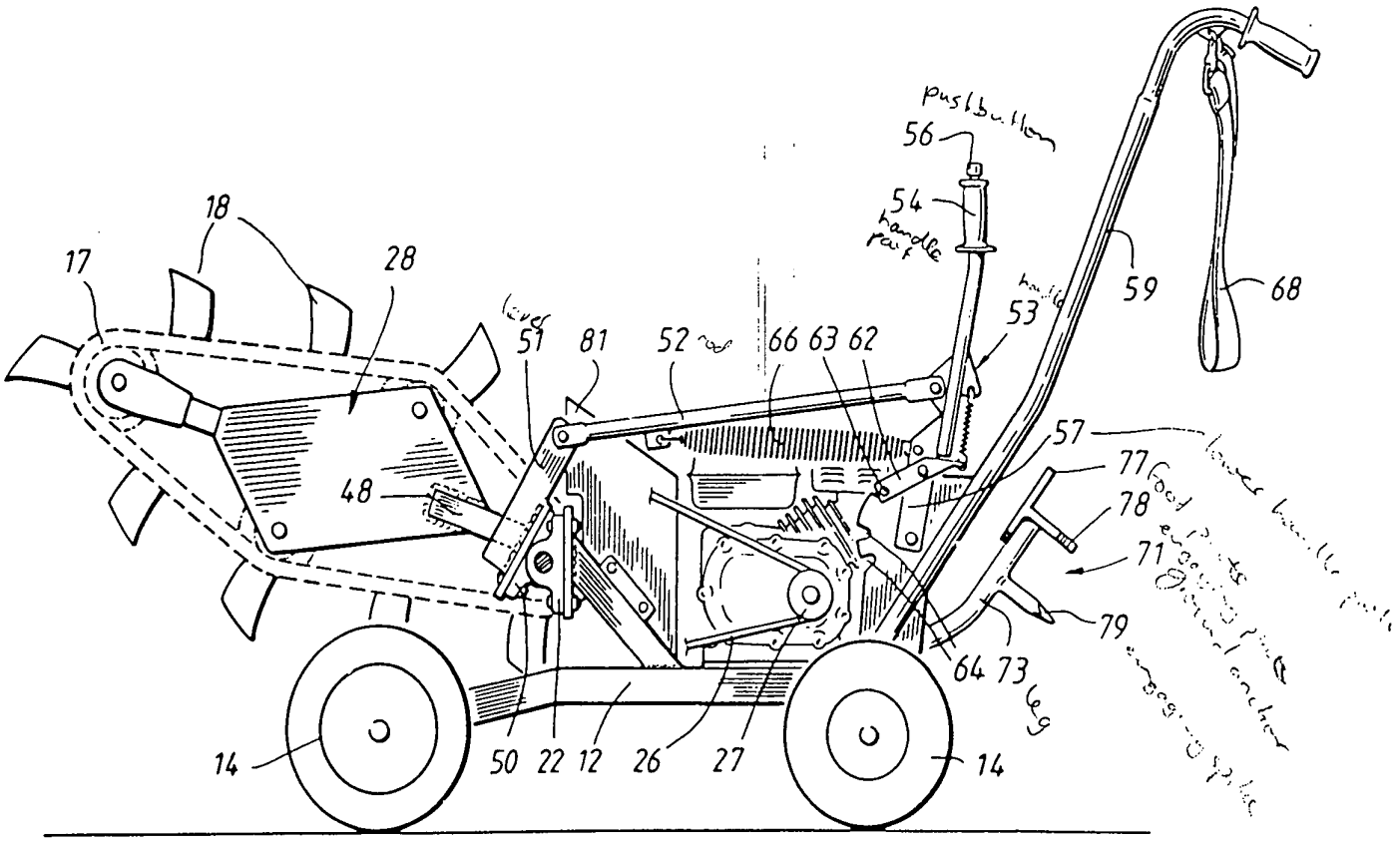
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Fig. 5.

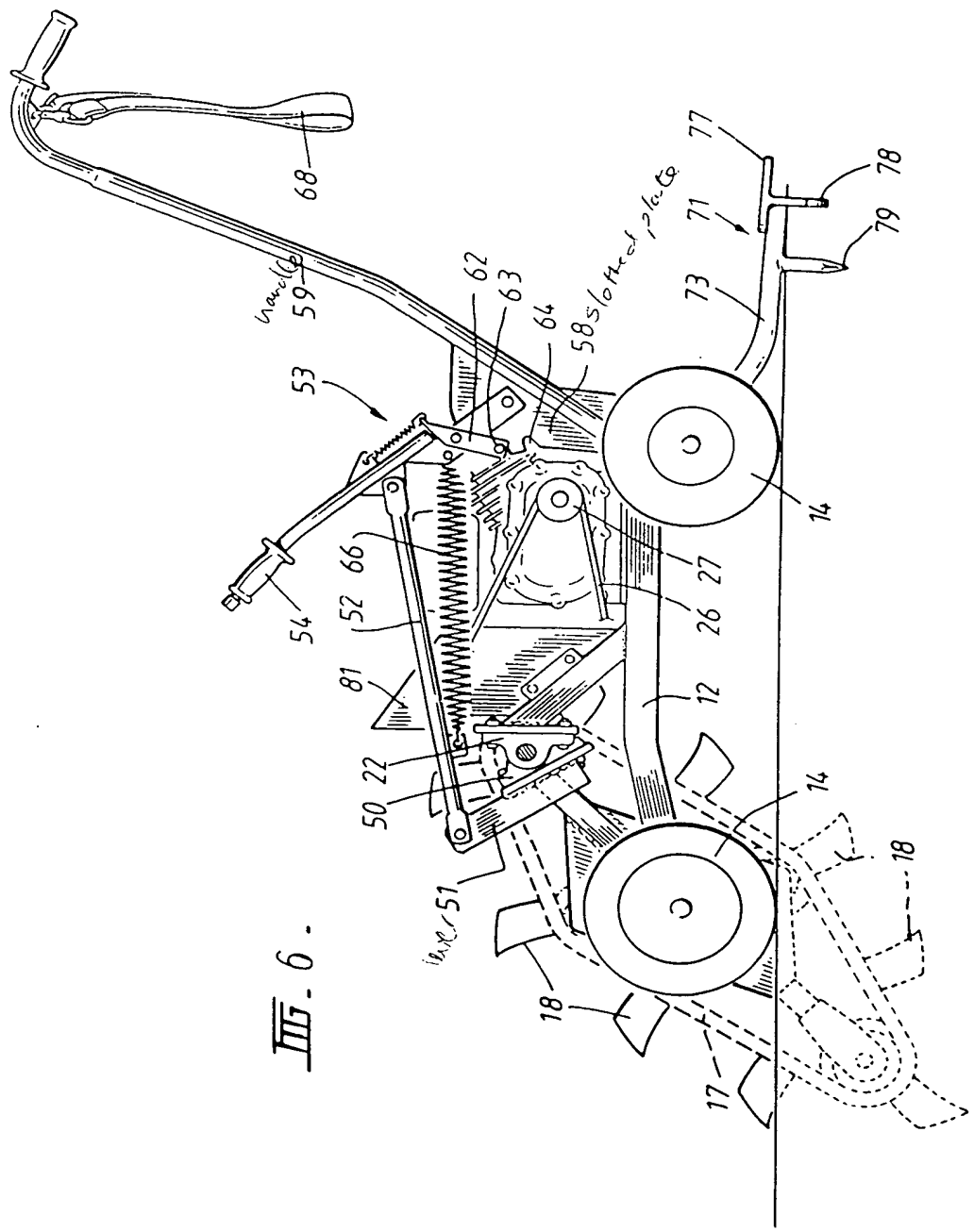
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Fig. 6.

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I, JONNE YABSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PR 3436 for a patent by PHILIP DICKINS filed on 28 February 2001.

WITNESS my hand this
Twelfth day of March 2002

JR Yabsley

JONNE YABSLEY
TEAM LEADER EXAMINATION
SUPPORT AND SALES